Name _____ **Period** _____

Chapter 34: The Origin and Evolution of Vertebrates

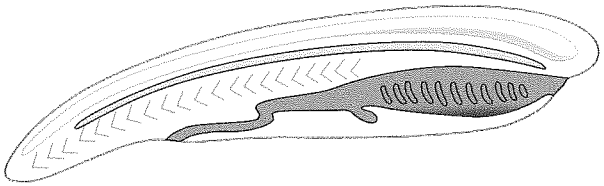
This chapter focuses on vertebrate groups and their evolution. We have selected key information in this chapter to give you an overview of this important group. A biologically literate person should know features that make life on land possible for animals, as well as adaptations that have occurred over time leading to the many diverse groups. How are amphibians different from reptiles? Is a salamander a reptile or an amphibian? Why? Many topics in this chapter are outside the Curriculum Framework for AP Biology, but we consider this material important for your background as a biologist.

Concept 34.1 Chordates have a notochord and a dorsal, hollow nerve cord

1. We are *vertebrates*. What *phylum* do we belong to? _____

2. Based on Figure 34.2, what other phylum would be considered the closest relative to phylum Chordata? _____ Why?

3. Here is a figure showing the four key chordate characteristics. Label and explain each one.



4. One of the important characteristics is a notochord. What is a *notochord*?

5. For us, as vertebrates, what remains of the notochord? Take note of the fact that a notochord is *not* a spinal cord!

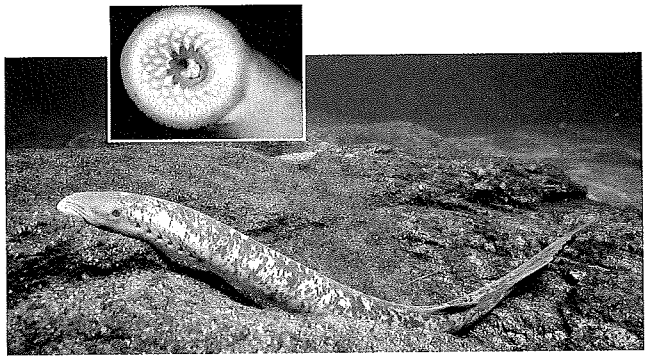
6. Chordates are the first group to show a *dorsal nerve cord*. Which embryonic layer forms the nerve cord?

7. *Pharyngeal gill slits* are one of the chordate characteristics you noted in question 3. What do the gill slits become in tetrapods?

Concept 34.2 *Vertebrates are chordates that have a backbone*

8. Living vertebrates share a set of derived characters that distinguish them from other chordates. A number of groups of genes have been duplicated in vertebrates. Why is this important to vertebrate evolution?

9. Lampreys and hagfishes are *jawless* vertebrates. What comprises their skeletons? Here is a photo showing the mouth of a lamprey. Notice the scraping mouth parts of this parasitic fish! They are used to penetrate the skin of another fish. Lampreys have invaded the Great Lakes and damaged the fishing industry there.



Concept 34.3 *Gnathostomes are vertebrates that have jaws*

10. *Gnatho–* means "jaw," and *–stome* means "mouth." This group includes the sharks, fishes, amphibians, reptiles (including birds), and mammals. Read carefully about the common ancestors of all gnathostomes. What is the significance of *Hox* gene duplications?

11. What animals are in the clade Chondrichthyes?

12. What does the name *Chondrichthyes* mean? What material makes up the skeleton of a member of this clade?

13. Why do sharks have to swim continuously?

14. The "fishes" with a bone skeleton are aquatic Osteichthyes. How do they breathe?

15. What is the function of a swim bladder?

***Concept 34.4** Tetrapods are gnathostomes that have limbs*

16. What does *tetrapod* mean?

17. Why is the fossil lobe-fin fish named *Tiktaalik* so important? How do its features illustrate Darwin's concept of descent with modification?

18. What animals are amphibians?

19. What does the name *Amphibia* mean?

20. Frogs have a life cycle with an aquatic larval stage, the *tadpole*. How do tadpoles breathe?

21. How do adult frogs breathe? (two ways)

22. Fertilization in amphibians is _____. The eggs lack a shell, and mortality is very high.

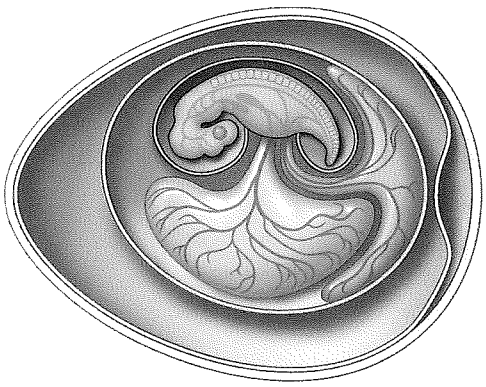
23. What factors tie many amphibians to a life near water?

***Concept 34.5** Amniotes are tetrapods that have a terrestrially adapted egg*

24. What is an *amniotic egg*? How has it enabled animals to occupy a wider range of terrestrial habitats than amphibians can?

25. What groups have an *amniote egg*?

26. Label the four *extraembryonic membranes* seen in an *amniotic egg*, and explain the role of each one.



27. What animals are in the *reptile* clade?

28. Make a list of five characteristics of most reptiles. For each, give the evolutionary advantage of the characteristic.

29. Fishes, amphibians, and reptiles are *ectothermic*. What does this mean?

30. Birds are in the reptile clade. Which extinct group included their closest relatives?

31. Here is a short list of some reptile groups. For each group, give some important features that make them unique.

snakes

lizards

turtles

alligators and crocodiles

birds

32. Many of the characters of birds are adaptations that facilitate flight. What are four avian adaptations for flight? What evolutionary advantages are offered by flight?

Adaptations for Flight

Concept 34.6 *Mammals are amniotes that have hair and produce milk*

33. Make a list of at least five shared derived characters of mammals. Put an asterisk (*) next to the traits unique to mammals (be sure you are clear on the term "shared derived character," which was covered in the evolution section).

34. There are three groups of mammals. Contrast the groups based on how they bear young, and give an example of each group.

Mammalian Group	Reproduction	Example
Monotremes		
Marsupials		
Eutherians		

35. As a human, you are in the class Mammalia and the order Primates. What features are unique to *primates* only?

Test Your Understanding Answers

Now you should be ready to test your knowledge. Place your answers here:

1. _____ 2. _____ 3. _____ 4. _____ 5. _____